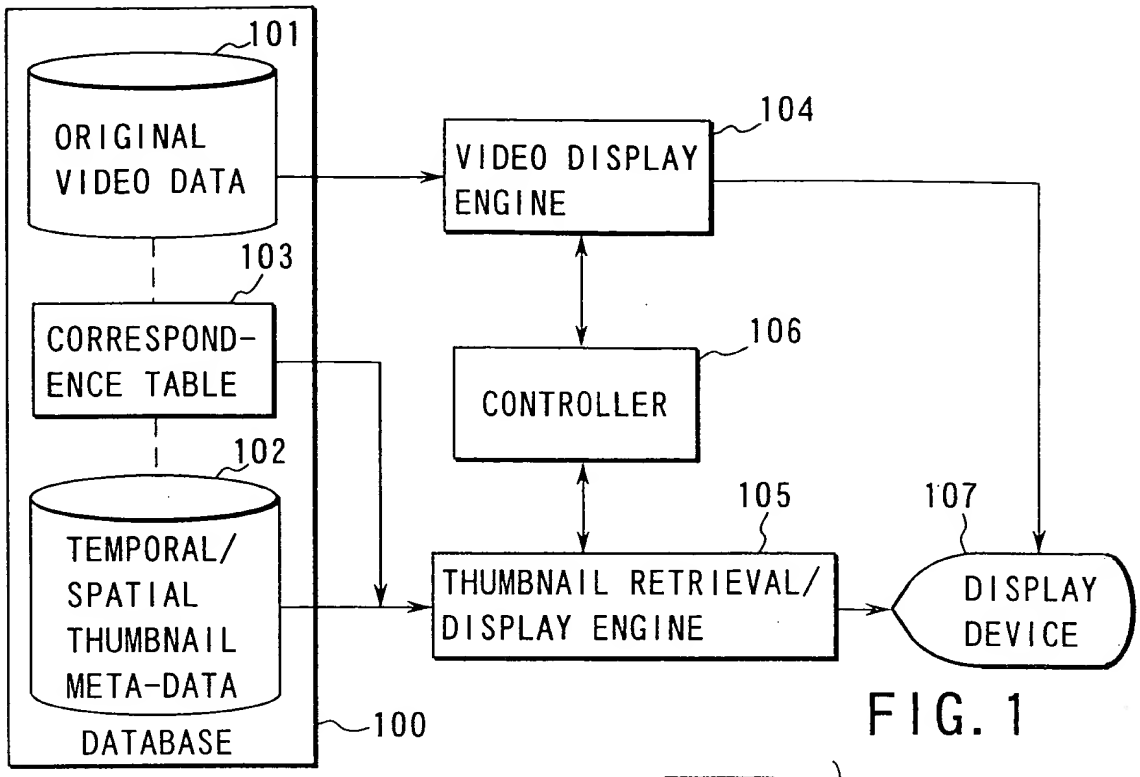

101
ORIGINAL VIDEO DATA
103
CORRESPOND-ENCE TABLE
102
TEMPORAL/ SPATIAL THUMBNAIL META-DATA
DATABASE
100
104
VIDEO DISPLAY ENGINE
106
CONTROLLER
105
THUMBNAIL RETRIEVAL/ DISPLAY ENGINE
107
DISPLAY DEVICE

FIG. 1

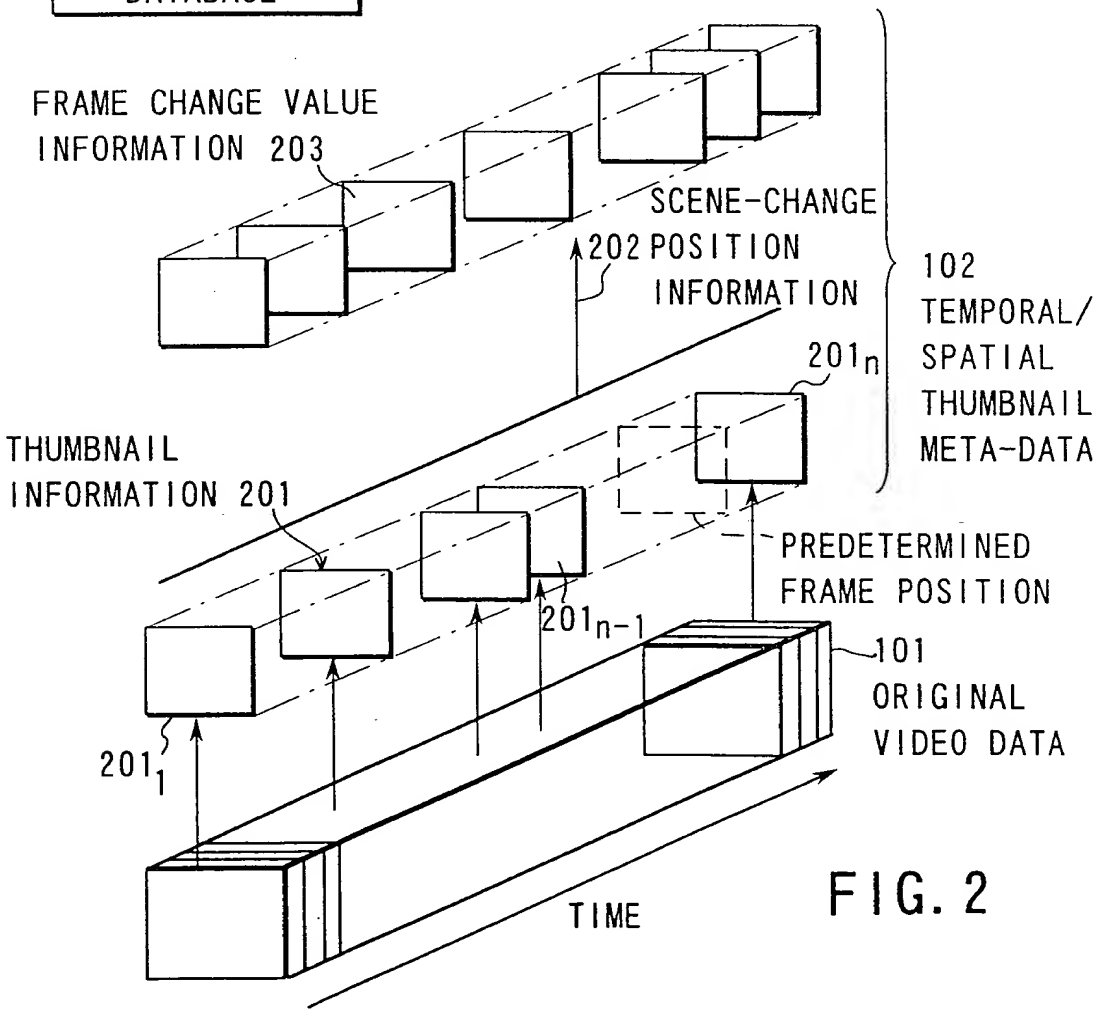

FRAME CHANGE VALUE INFORMATION 203
SCENE-CHANGE POSITION INFORMATION 202
102 TEMPORAL/ SPATIAL THUMBNAIL META-DATA
201_n
THUMBNAIL INFORMATION 201
PREDETERMINED FRAME POSITION
201_{n-1}
101 ORIGINAL VIDEO DATA
201_1
TIME

FIG. 2

201

THUMBNAIL INFORMATION
- FRAME NUMBER OR TIME OF ORIGINAL VIDEO DATA
- SIZE (HEIGHT×WIDTH)
- NUMBER OF FRAMES (ORIGINAL VIDEO DATA) OR TIME UNTIL NEXT FRAME
- IMAGE FORMAT (JPEG, RGB, YUV ETC.)
- THUMBNAIL DATA (OR POINTER FOR ORIGINAL IMAGE DATA)

FIG. 3

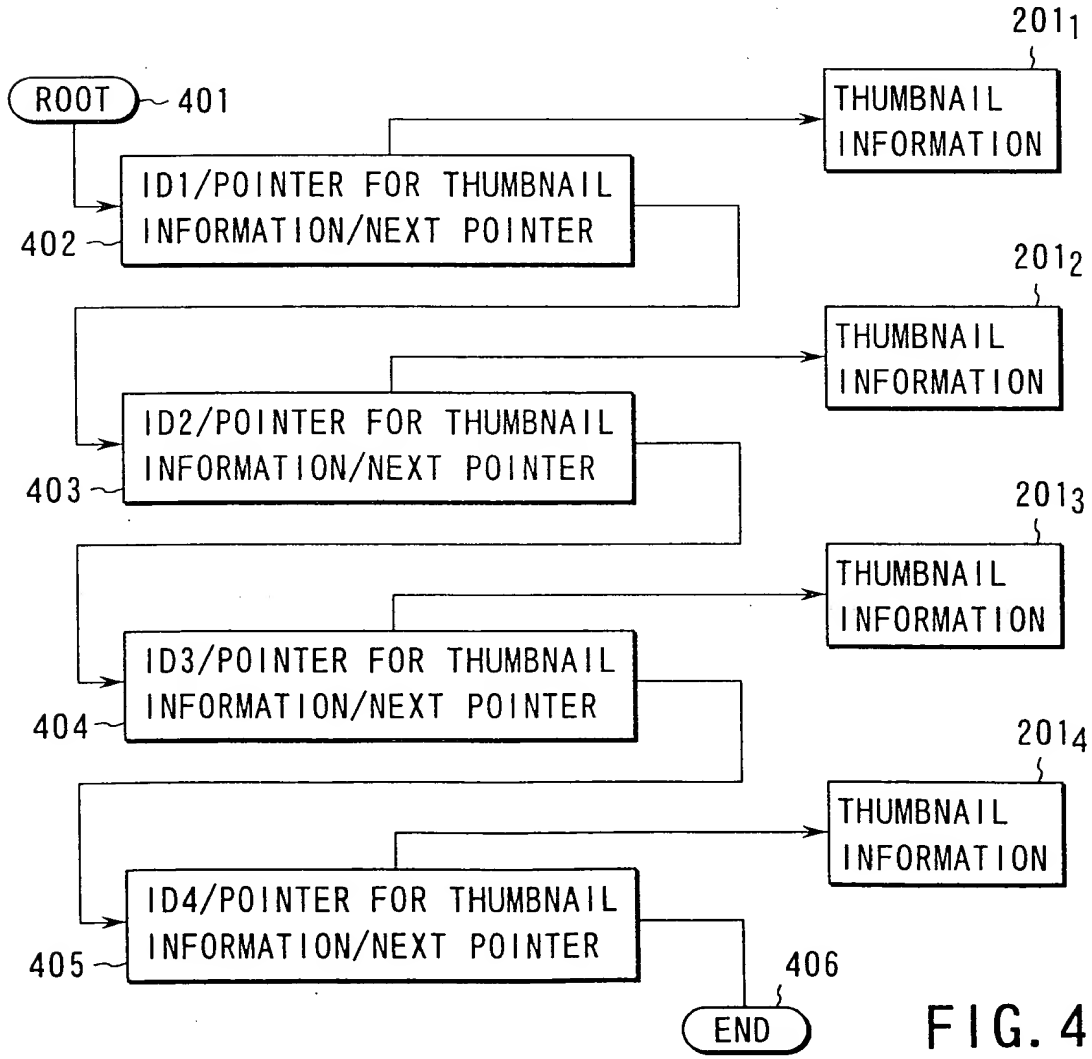


FIG. 4

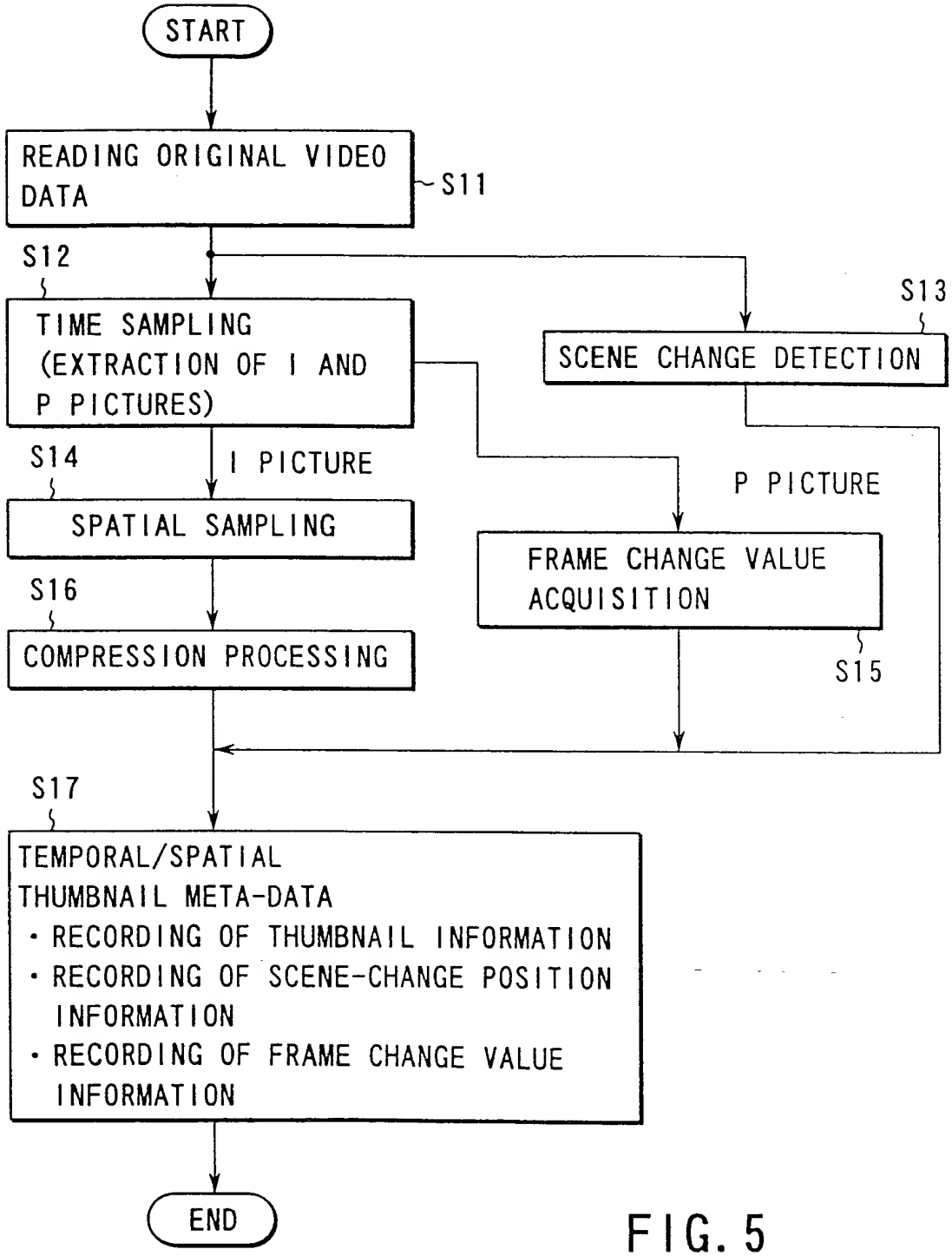

START
READING ORIGINAL VIDEO DATA
S11
S12
TIME SAMPLING (EXTRACTION OF I AND P PICTURES)
S13
SCENE CHANGE DETECTION
S14
I PICTURE
P PICTURE
SPATIAL SAMPLING
FRAME CHANGE VALUE ACQUISITION
S16
COMPRESSION PROCESSING
S15
S17
TEMPORAL/SPATIAL THUMBNAIL META-DATA
• RECORDING OF THUMBNAIL INFORMATION
• RECORDING OF SCENE-CHANGE POSITION INFORMATION
• RECORDING OF FRAME CHANGE VALUE INFORMATION
END

FIG. 5

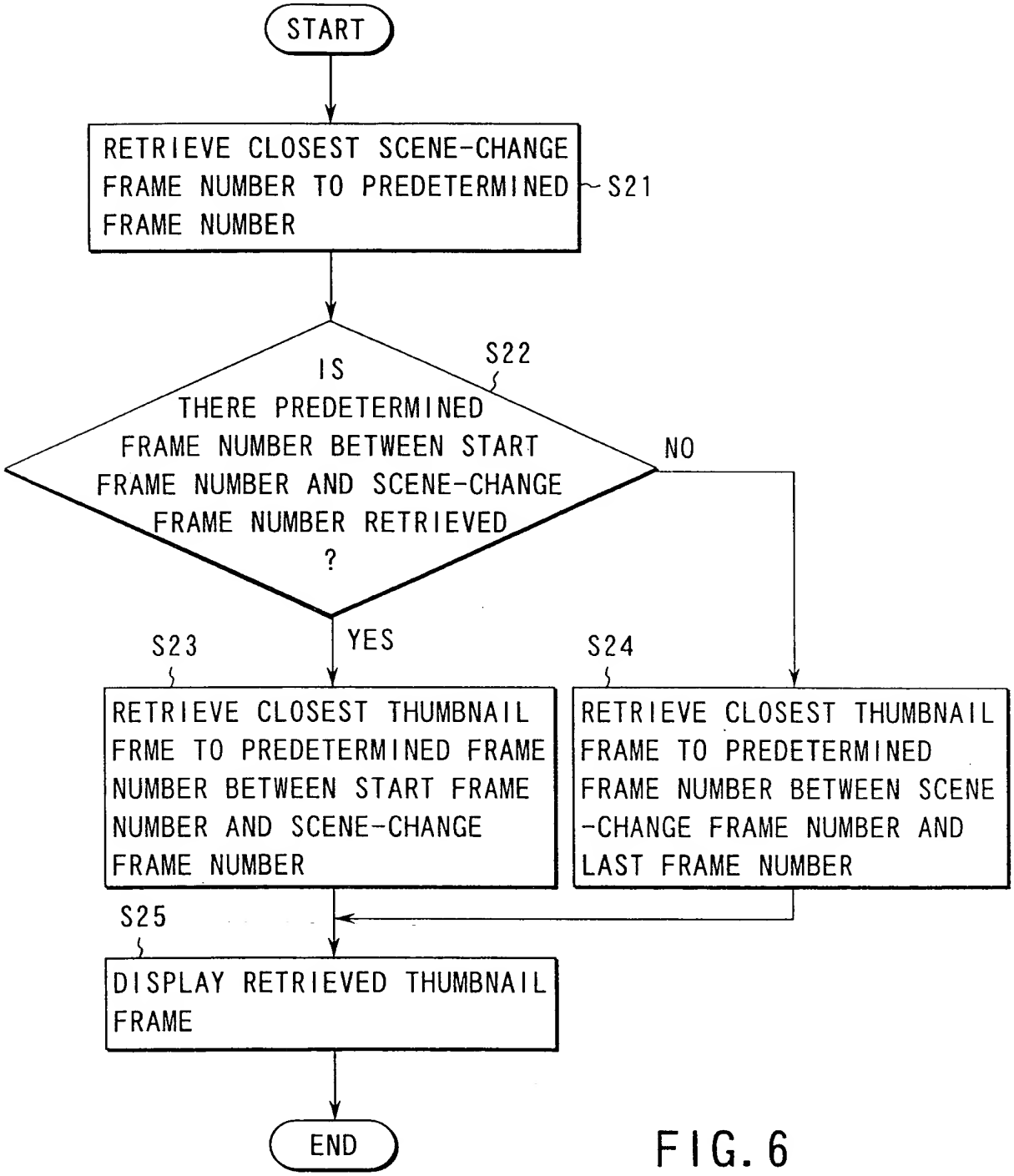

START
RETRIEVE CLOSEST SCENE-CHANGE FRAME NUMBER TO PREDETERMINED FRAME NUMBER
S21
IS THERE PREDETERMINED FRAME NUMBER BETWEEN START FRAME NUMBER AND SCENE-CHANGE FRAME NUMBER RETRIEVED ?
S22
NO
YES
S23
RETRIEVE CLOSEST THUMBNAIL FRME TO PREDETERMINED FRAME NUMBER BETWEEN START FRAME NUMBER AND SCENE-CHANGE FRAME NUMBER
S24
RETRIEVE CLOSEST THUMBNAIL FRAME TO PREDETERMINED FRAME NUMBER BETWEEN SCENE -CHANGE FRAME NUMBER AND LAST FRAME NUMBER
S25
DISPLAY RETRIEVED THUMBNAIL FRAME
END

FIG. 6

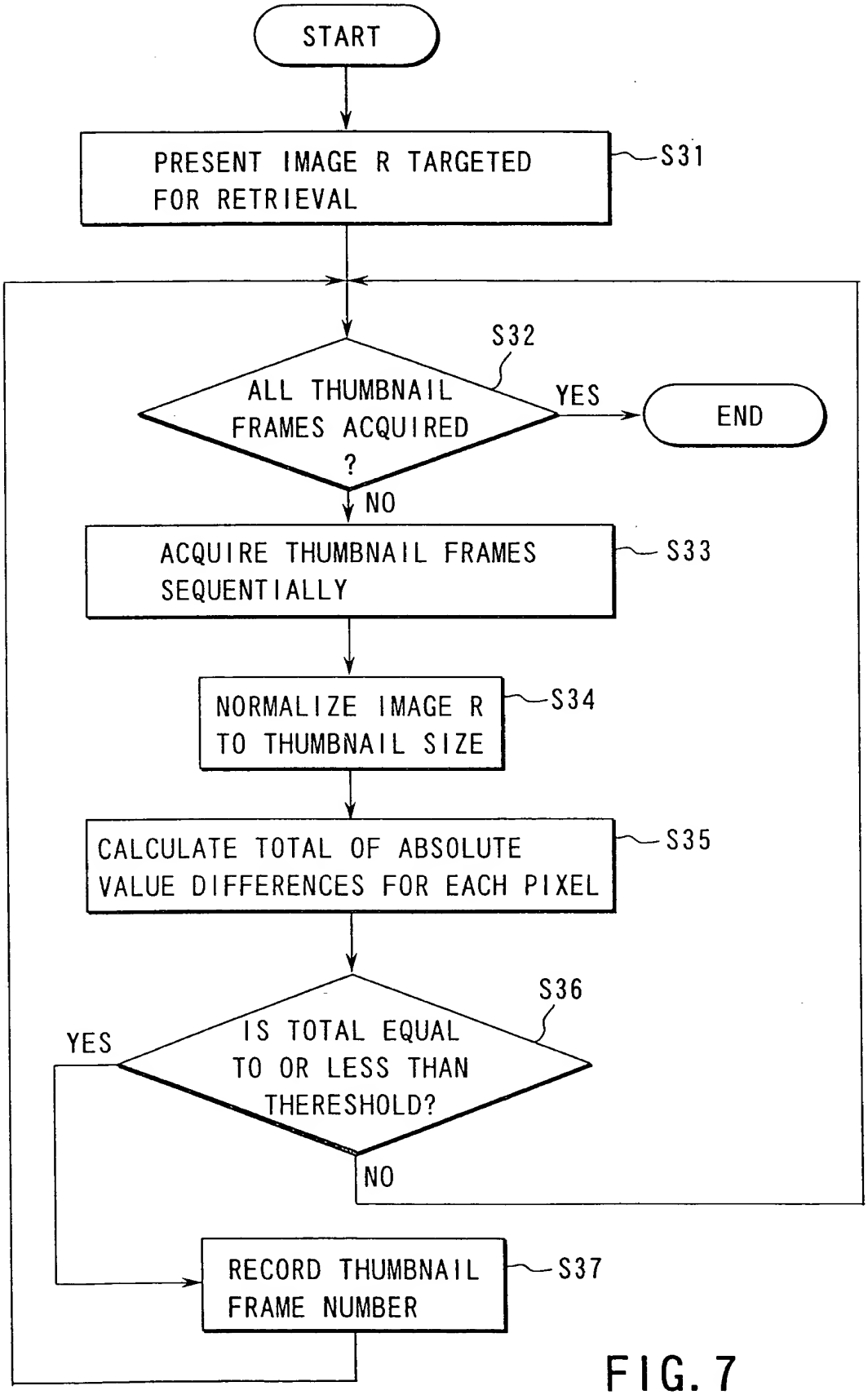

START
PRESENT IMAGE R TARGETED FOR RETRIEVAL
S31
S32
ALL THUMBNAIL FRAMES ACQUIRED ?
YES
END
NO
ACQUIRE THUMBNAIL FRAMES SEQUENTIALLY
S33
NORMALIZE IMAGE R TO THUMBNAIL SIZE
S34
CALCULATE TOTAL OF ABSOLUTE VALUE DIFFERENCES FOR EACH PIXEL
S35
S36
IS TOTAL EQUAL TO OR LESS THAN THERESHOLD?
YES
NO
RECORD THUMBNAIL FRAME NUMBER
S37

FIG. 7

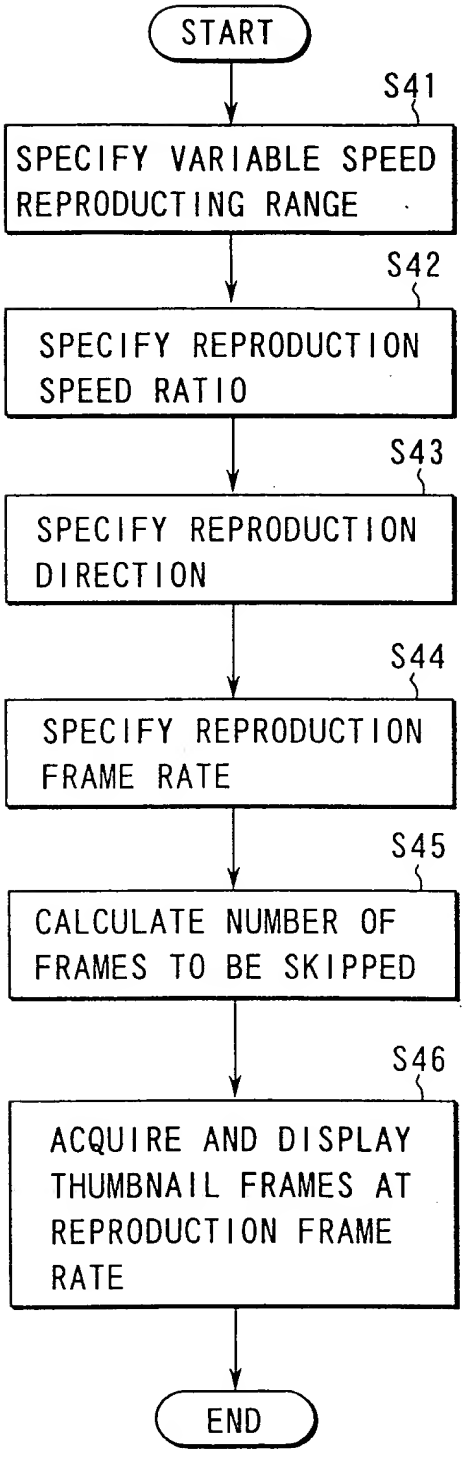

START
S41
SPECIFY VARIABLE SPEED REPRODUCTING RANGE
S42
SPECIFY REPRODUCTION SPEED RATIO
S43
SPECIFY REPRODUCTION DIRECTION
S44
SPECIFY REPRODUCTION FRAME RATE
S45
CALCULATE NUMBER OF FRAMES TO BE SKIPPED
S46
ACQUIRE AND DISPLAY THUMBNAIL FRAMES AT REPRODUCTION FRAME RATE
END

FIG. 8

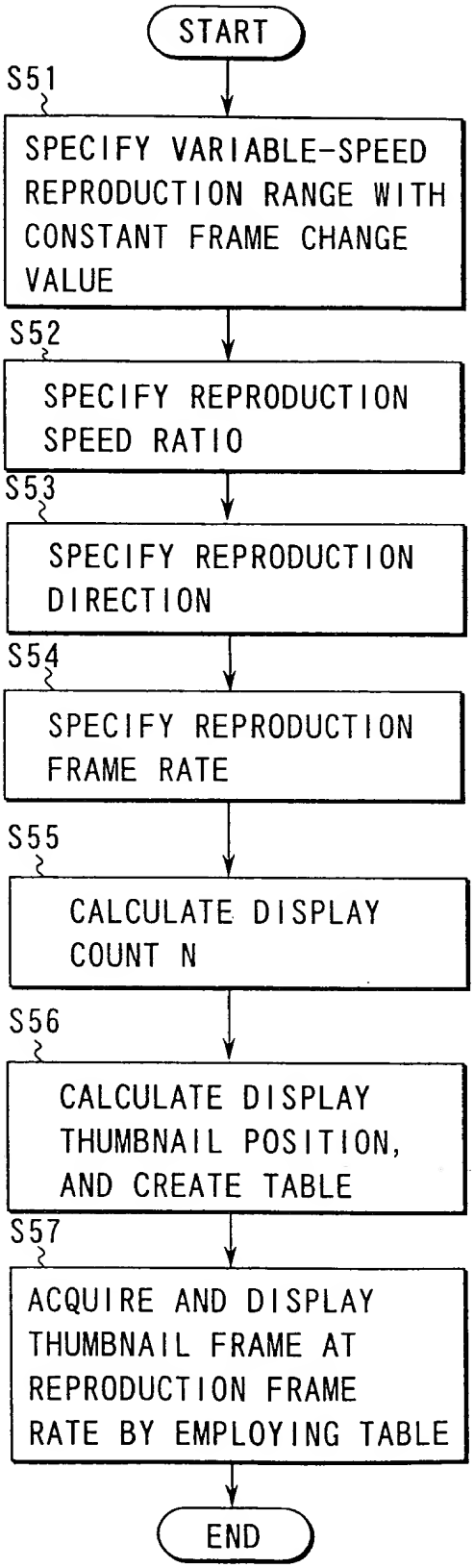

START
S51
SPECIFY VARIABLE-SPEED REPRODUCTION RANGE WITH CONSTANT FRAME CHANGE VALUE
S52
SPECIFY REPRODUCTION SPEED RATIO
S53
SPECIFY REPRODUCTION DIRECTION
S54
SPECIFY REPRODUCTION FRAME RATE
S55
CALCULATE DISPLAY COUNT N
S56
CALCULATE DISPLAY THUMBNAIL POSITION, AND CREATE TABLE
S57
ACQUIRE AND DISPLAY THUMBNAIL FRAME AT REPRODUCTION FRAME RATE BY EMPLOYING TABLE
END

FIG. 9

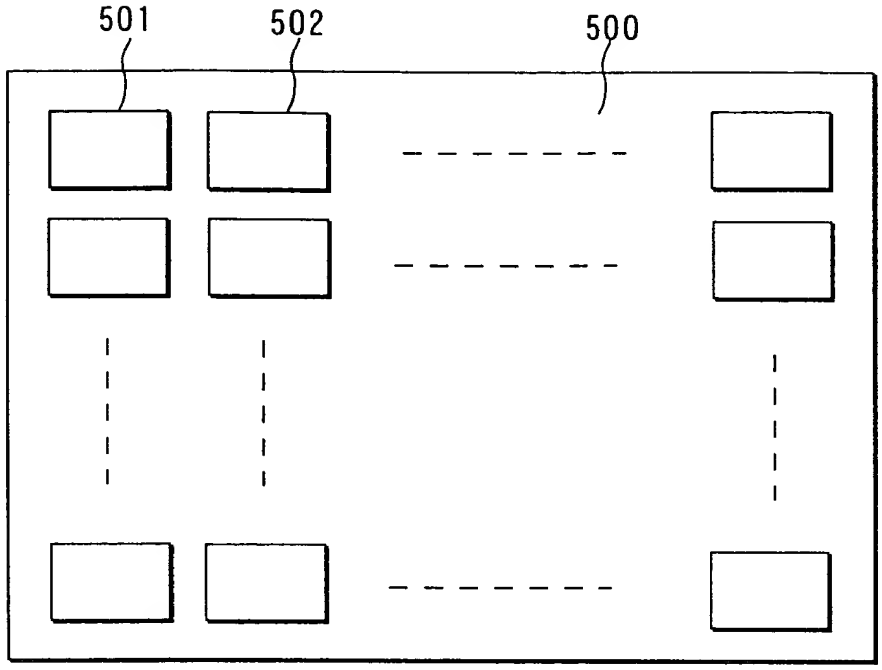


FIG. 10

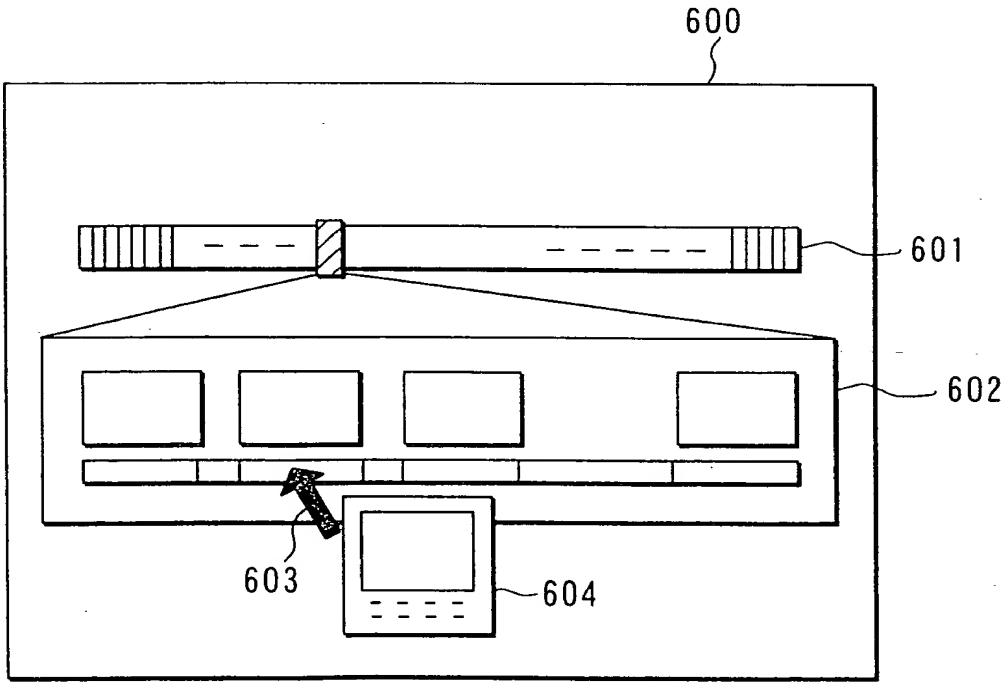


FIG. 11

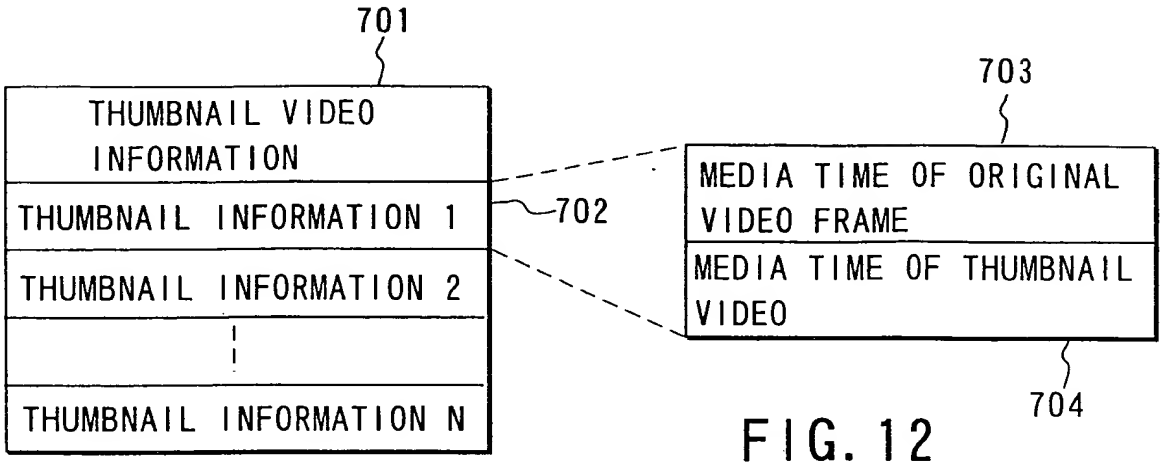


FIG. 12

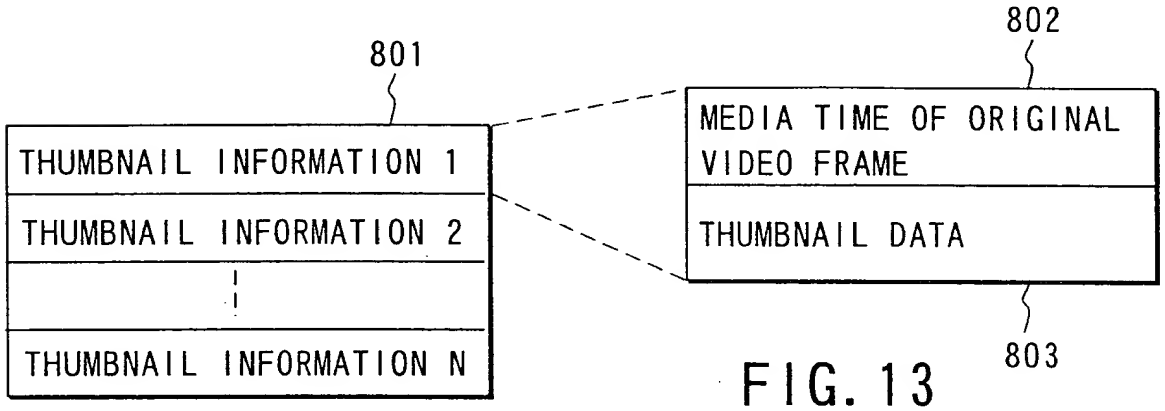


FIG. 13

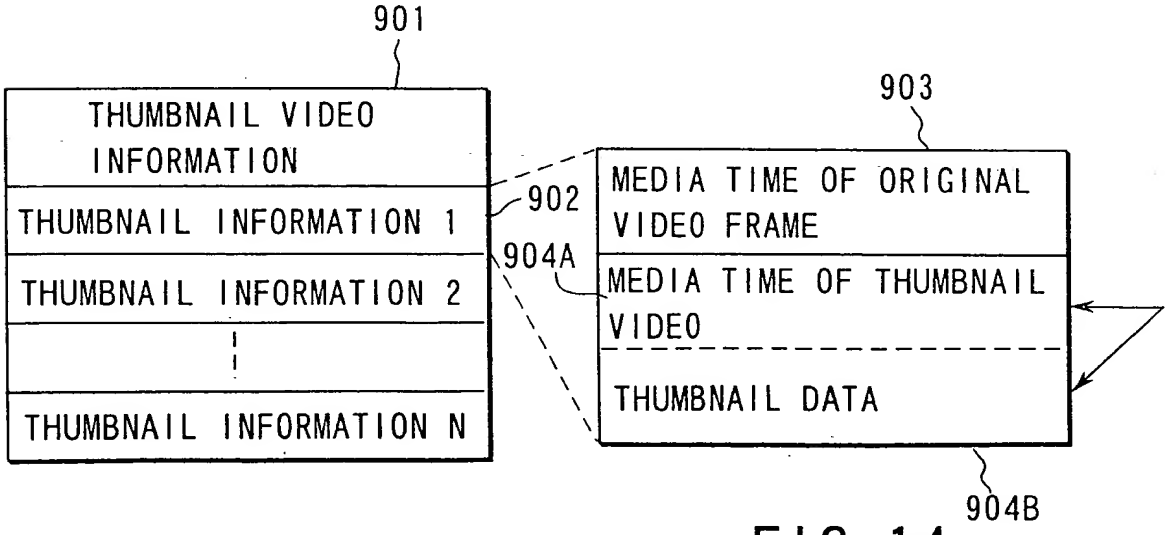


FIG. 14

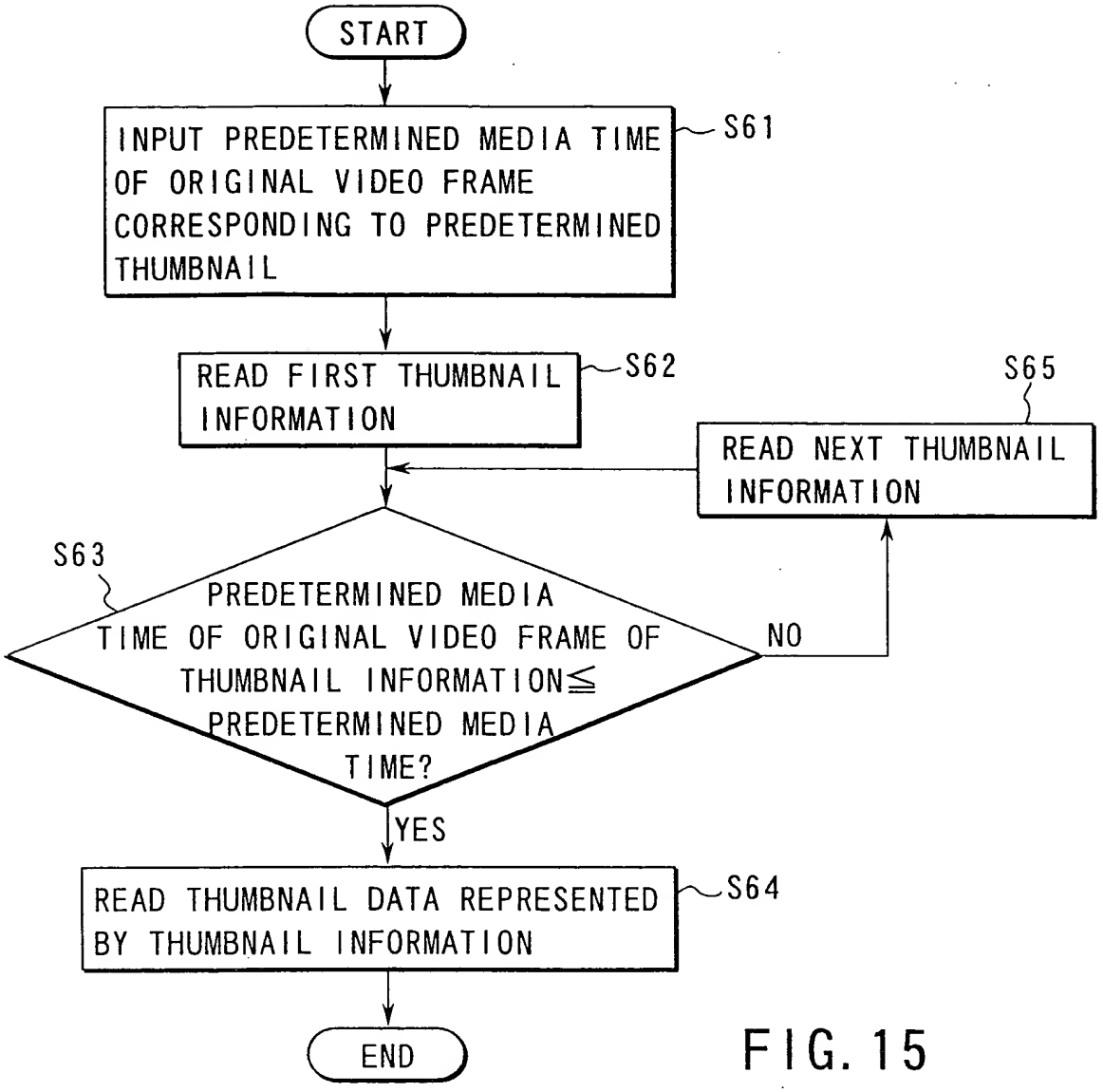

START
INPUT PREDETERMINED MEDIA TIME OF ORIGINAL VIDEO FRAME CORRESPONDING TO PREDETERMINED THUMBNAIL
S61
READ FIRST THUMBNAIL INFORMATION
S62
S65
READ NEXT THUMBNAIL INFORMATION
S63
PREDETERMINED MEDIA TIME OF ORIGINAL VIDEO FRAME OF THUMBNAIL INFORMATION≦ PREDETERMINED MEDIA TIME?
NO
YES
READ THUMBNAIL DATA REPRESENTED BY THUMBNAIL INFORMATION
S64
END

FIG. 15

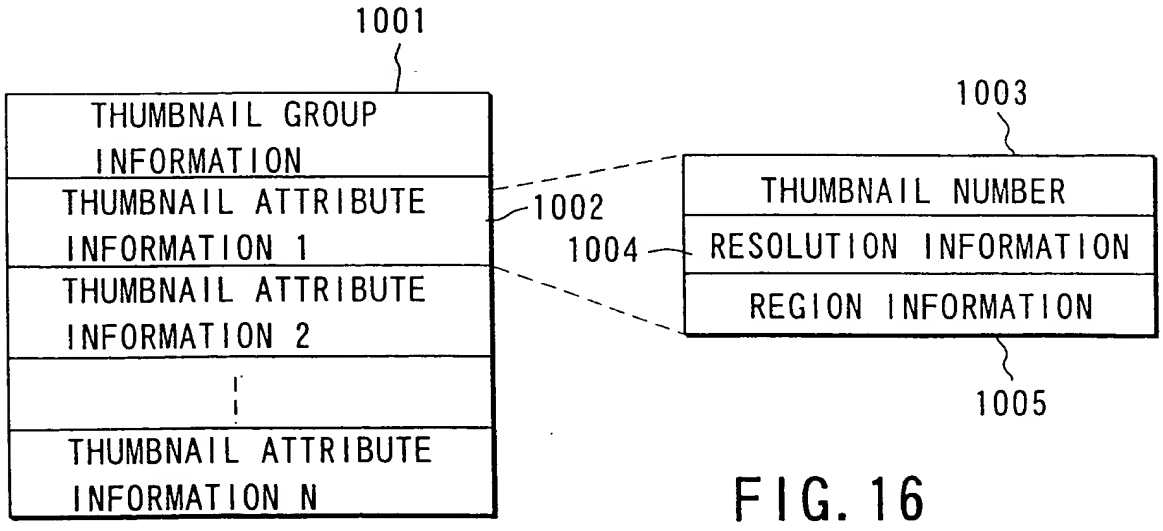
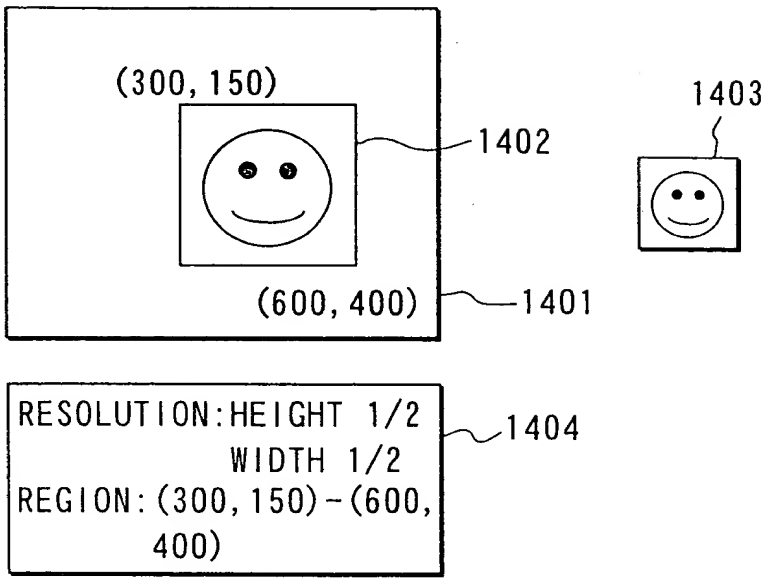

1001
THUMBNAIL GROUP INFORMATION
THUMBNAIL ATTRIBUTE INFORMATION 1
THUMBNAIL ATTRIBUTE INFORMATION 2
THUMBNAIL ATTRIBUTE INFORMATION N
1002
1003
THUMBNAIL NUMBER
1004
RESOLUTION INFORMATION
REGION INFORMATION
1005

FIG. 16

FIG. 17


(300, 150)
1402
1403
(600, 400)
1401
RESOLUTION: HEIGHT 1/2
WIDTH 1/2
REGION: (300, 150) - (600, 400)
1404

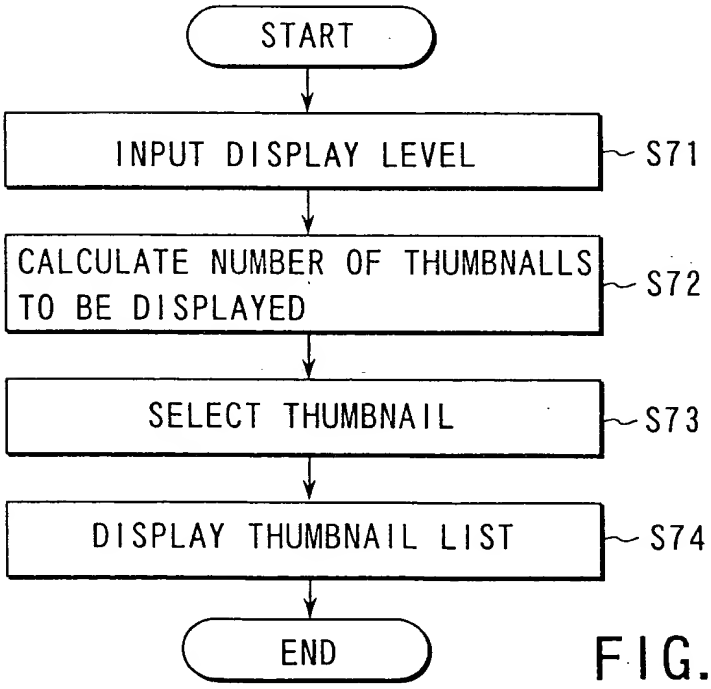

START
INPUT DISPLAY LEVEL
S71
CALCULATE NUMBER OF THUMBNALLS TO BE DISPLAYED
S72
SELECT THUMBNAIL
S73
DISPLAY THUMBNAIL LIST
S74
END

FIG. 18

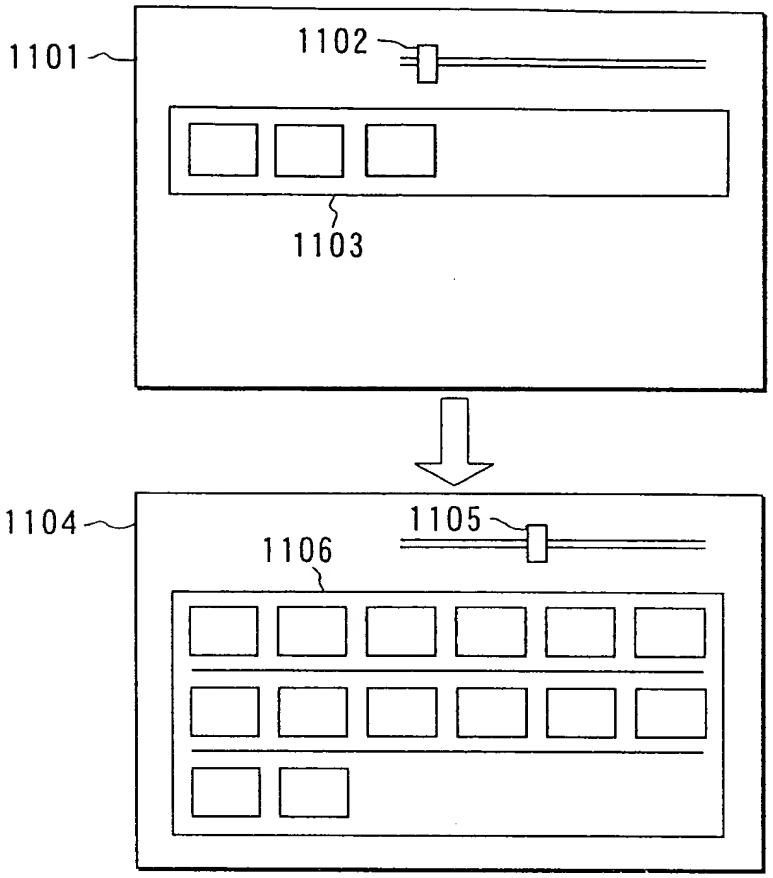


FIG. 19

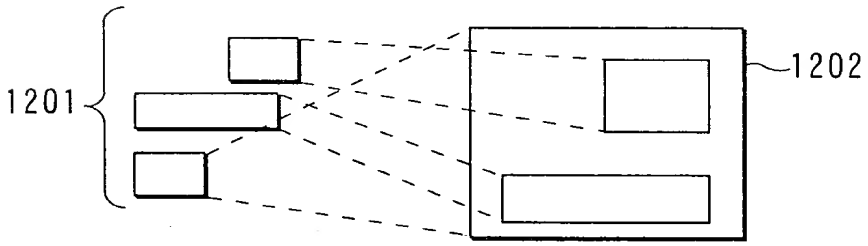


FIG. 20

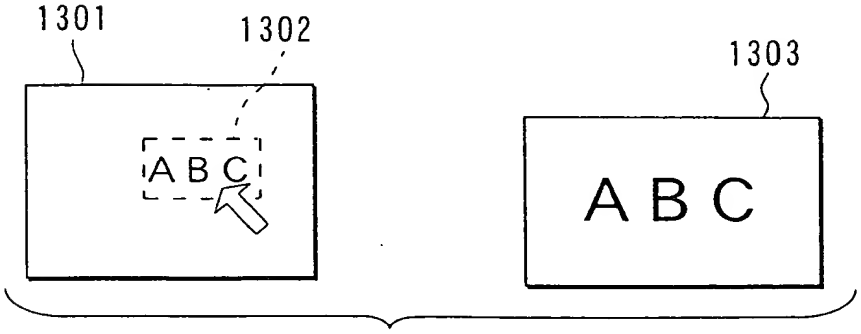


FIG. 21